



**Professor Robert Smith**  
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Professor of NDT and High Value Manufacturing

**Area of research**

NDT for High Value Manufacturing of Composites

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**Summary**

Following an EPSRC Fellowship in Manufacturing entitled 'NDT for High Value Manufacturing of Composites', now combining the role of Director of the UK Research Centre for Non-destructive Evaluation with a research portfolio in the NDT of Composites. This involves researching new non-destructive testing methods for 3D characterisation of composites and evolving a strategy for ensuring they benefit the structural integrity of aerostructures and engines, wind turbines, etc. The ultimate aim is to enable the optimum use of composite materials by providing detailed information about the actual as-manufactured inner quality, thus moving from conservative designs to lightweight high-performance optimally designed components. An additional benefit would be facilitating the use of lower-cost manufacturing methods.

**Biography**

I have 30 years of research experience in ultrasonics, signal processing, data analysis and instrumentation, the first six years being at the National Physical Laboratory (NPL) where I was involved in establishing a National Measurement System for medical ultrasound field characterisation and contributed to the preparation of international standards. In 1989 I moved to the Non-destructive Evaluation (NDE) Group at the Royal Aerospace Establishment, Farnborough, later becoming the Defence Evaluation and Research Agency (DERA), and then QinetiQ Ltd. Whilst there, I developed the ANDSCAN<sup>®</sup> portable scanning system and arranged for its commercial exploitation. More recent activities have included the development of TRECSCAN<sup>®</sup> – a transient eddy-current instrument, 3D-VALIDATOR<sup>™</sup> for 3D-profiling the ply stacking sequence and ply wrinkling of composites, and PINPOINT<sup>®</sup> for automated analysis and sentencing of composite C-scans. My current areas of interest focus on composite inspection for aerospace and renewable power, especially the ultrasonic 3D characterisation of the inner quality of composites. Through an EPSRC Fellowship in Manufacturing, I am now seeking to build an academic research programme at the University of Bristol that benefits from my extensive experience in the use of structural composites in a wide range of applications from wind turbines through maritime vessels to aircraft and spacecraft, and of composite manufacturing processes from first-hand experience spanning four continents and several industries.

**Keywords**

- Ultrasound. Non-destructive Testing. Inspection. Composite Materials.

**Memberships**

**Organisations**

[Department of Mechanical Engineering](#)

**Other sites**

- [Mecheng](#)

## Research Groups

- [Ultrasonics and Non-destructive Testing \(UNDT\) - Core](#)

## Recent publications

- Tretiak, I & Smith, RA, 2019, '[A parametric study of segmentation thresholds for X-ray CT porosity characterisation in composite materials](#)'. *Composites Part A: Applied Science and Manufacturing*, vol 123., pp. 10-24
- Kirkpatrick, J, Wilcox, P & Smith, R, 2019, '[Row-column Addressed Arrays for Non-Destructive Evaluation Applications](#)'. *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*.
- Nelson, LJ & Smith, RA, 2019, '[Fibre direction and stacking sequence measurement in carbon fibre composites using Radon transforms of ultrasonic data](#)'. *Composites Part A: Applied Science and Manufacturing*, vol 118., pp. 1-8
- Smith, R, Nelson, L, Mienczakowski, M & Wilcox, P, 2018, '[Ultrasonic Analytic-Signal Responses from Polymer-Matrix Composite Laminates](#)'. *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, vol 65., pp. 231-243
- Tayong, RB, Mienczakowski, MJ & Smith, RA, 2018, '[3D ultrasound characterization of woven composites](#)'. in: *44th Annual Review of Progress in Quantitative Nondestructive Evaluation*. American Institute of Physics (AIP)
- Xie, N, Smith, RA, Mukhopadhyay, S & Hallett, SR, 2018, '[A numerical study on the influence of composite wrinkle defect geometry on compressive strength](#)'. *Materials and Design*, vol 140., pp. 7-20
- Larrañaga-Valsero, B, Smith, RA, Tayong, RB, Fernández-López, A & Güemes, A, 2018, '[Wrinkle measurement in glass-carbon hybrid laminates comparing ultrasonic techniques: A case study](#)'. *Composites Part A: Applied Science and Manufacturing*, vol 114., pp. 225-240
- Nelson, L, Smith, R & Mienczakowski, M, 2018, '[Ply-orientation measurements in composites using structure-tensor analysis of volumetric ultrasonic data](#)'. *Composites Part A: Applied Science and Manufacturing*, vol 104., pp. 108-119
- Hughes, RR, Drinkwater, B & Smith, R, 2018, '[Characterisation of carbon fibre-reinforced polymer composites through radon-transform analysis of complex eddy-current data](#)'. *Composites Part B: Engineering*, vol 148., pp. 252-259
- Smith, RA, Nelson, LJ & Mienczakowski, MJ, 2018, '[Phononic band gaps and phase singularities in the ultrasonic response from toughened composites](#)'. in: *44th Annual Review of Progress in Quantitative Nondestructive Evaluation, Volume 37*. American Institute of Physics (AIP)

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